## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments with respect to claims 1-3, and 5-13 have been considered but are moot in view of the new ground(s) of rejection.

The applicants have amended independent claim 1 to further define the static contact angle of the hydrophobic layer measured with water, and incorporated limitations regarding the structural relationship between the hydrophobic layer, channel area, and the sensor electrode, presenting new combinations and limitations, not previously presented, for consideration upon merits for patentability.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-3 and 5-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burgmair et al. (Humidity and temperature compensation in work function gas sensor FETs), in view of Johnson et al. (USP 4,020,830) and Sweryda-Krawiec et al. (A new interpretation of serum albumin surface passivation, referred to herein as "Sweryda").

Regarding claim 1, Burgmair discloses a gas sensitive FET **(Fig. 2)** comprising: a source, drain, channel, suspended silicon gate, gas sensitive film, and gate insulator arranged in a hybrid suspended gate configuration, having an air gap. Burgmair further discloses that humidity induces contributions to the sensor signal and a baseline drift **(Abstract)**, as well as identifies that the gate insulator surface is not ideally chemically inert **(pp272, see: 3. Gate insulator surface)**.

Burgmair does not explicitly disclose a hydrophobic layer being arranged on the surface of the gas sensor between the gas sensitive layer and the channel area and/or a sensor electrode, wherein the hydrophobic layer is separated from at least one of the

channel area and the sensor electrode, delimiting them in a ring-like or a frame-like manner. The static contact angle of the hydrophobic layer measured with water and obtained in a planar surface being at least 105°.

Johnson teaches a chemical sensitive field-effect transistor transducer **(Fig. 2)** comprising a hydrophobic layer **(44)** of solution impervious material, such as a polymerized epoxy resin **(C5/L51-53)**, arranged to cover the insulator material **(36)** and delimit the channel area in a frame like manner **(see: how layer 44 delimits the channel area between the source and drain)**.

Sweryda teaches a modified glass surface, having a fluorinated self-assembled monolayer **(pp2054/C1/L11-12)** of trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane **(pp2054/C2/L18-19)**, which has a contact angle above 105° **(pp2055/C1/L2)**.

It would have been obvious to one having ordinary skill in the art at the time of the invention to incorporate an inert hydrophilic layer of trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane to cover the gate insulator material of Burgmair, as taught by Johnson and Sweryda, since doing so would provide an ideally chemically inert gate insulator surface, as well as provide for the detection of ion activity **(Johnson C5/L46-51)**. Additionally, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. In the instant case, Burgmair teaches that humidity induces contributions to the sensor signal and a baseline drift **(Abstract)**, therefore it would have been obvious to incorporate a highly hydrophobic

layer into the gas sensor of Burgmair to produce a cleaner baseline signal, as well as to eliminate drift.

Regarding claim 2, modified Burgmair discloses all of the claim limitations as set forth above. Modified Burgmair further discloses an electrically conductive guard ring on its surface, which delimits the channel area and/or the sensor electrode leading to the channel area from the channel area and/or the sensor electrode by means of a space **(Burgmair: Fig. 2, see: guard ring)**, and further characterized in that the hydrophobic layer is arranged in at least one area of the surface of the gas sensor located between the guard ring and the channel area and/or the sensor electrode **(Burgmair: Fig. 2, see gate insulator; Johnson: Fig. 2, see: layer 44 arranged over gate insulator)**.

Regarding claim 3, modified Burgmair discloses all of the claim limitations as set forth above. Modified Burgmair further discloses the hydrophobic layer extends continuously over the channel area and/or the sensor electrode **(Burgmair: Fig. 2, see gate insulator; Johnson: Fig. 2, see: layer 44 arranged over gate insulator)**.

Regarding claim 5, modified Burgmair discloses all of the claim limitations as set forth above. Regarding limitations recited in claim 5 which are directed to specific properties of the hydrophobic layer recited in said claim, it is noted that the applicant's disclosure fails to identify any of the recited hydrophobic materials having a contact angle of at least 120°, or any contact angle. As such, for the purposes of examination, the two hydrophobic materials recited within the applicant's disclosure

(poly(heptadecafluoroacrylate) and tricholoro(1H, 1H, 2H, 2H-perfluorooctyl)silicate) will be interpreted to inherently display the recited properties.

Regarding claims 7, 8, and 13, modified Burgmair discloses all of the claim limitations as set forth above. Modified Burgmair further discloses the hydrophobic layer being a perfluoride polymer **(Sweryda: pp2054/C2/L18-19, see: trichloro(1H, 1H, 2H, 2H-perfluorooctyl)silane)**.

Regarding claims 10-12, modified Burgmair discloses all of the claim limitations as set forth above. Modified Burgmair further discloses the hydrophobic layer giving a surface profiling with projections and depressions in the form of slots or grooves to form a frame or ring around at least one of the channel area and the sensor electrode **(Johnson: Fig. 2, see: how layer 44 forms a groove which delimits the channel area between the source and drain to form a frame around the area)**.

6. Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burgmair et al. (Humidity and temperature compensation in work function gas sensor FETs), in view of Johnson et al. (USP 4,020,830) and Sweryda-Krawiec et al. (A new interpretation of serum albumin surface passivation, referred to herein as "Sweryda"), as applied to claims 1 and 7 above, in further view of Yang et al. (USP 6,670,286 B1).

Regarding claims 6 and 9, while modified Burgmair does not explicitly disclose that the molecules of the hydrophobic layer are covalently bound to the surface of an adjacent, preferably semi-conductive or electrically insulating layer of the gas sensor, and that the polymer is connected by an intermediate layer that is preferably in the form

of a monolayer to an adjacent, preferably semi- conductive or electrically insulating layer of the gas sensor, and further characterized in that the intermediate layer has at least one reactive group anchored on the adjacent layer, and that the polymer is coupled preferably by means of a covalent bond to the intermediate layer. Yang teaches a photopolymerization-based method for the fabrication of chemical sensing films that covalently binds a polymer film **(C7/L13-14)** onto an intermediate layer **(Fig. 1A, see: functionalization layer)** which has been covalently bound to a electrically insulating layer **(Fig. 1A, see: oxide base; C8/L51-52)**. It would have been obvious to one having ordinary skill in the art at the time of the invention to use a photopolymerization fabrication method in the gas sensor of modified Burgmair, as taught by Yang, since doing so allows the patterning of multiple regions of a selected film, or creating a sensor surface containing several films designed to detect different compounds **(Yang, see: Abstract)**.

## *Conclusion*

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT EOM whose telephone number is (571)270-7075. The examiner can normally be reached on Mon.-Thur., 9:00am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571)272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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